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Proceedings of the Third International Workshop on

Contemporary Problems in Mathematical Physics

Cotonou, Republic of Benin 1 – 7 November 2003

editors

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CONTEMPORARY PROBLEMS IN MATHEMATICAL PHYSICS

Proceedings of the Third International Workshop

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Foreword

This volume is the Proceedings of the Third International Workshop on Contemporary Problems in Mathematical Physics, which was held in Cotonou (Republic of Benin) from November 1st to 7th, 2003. Being the third such scientific gathering, following the First and Second Workshops on Contemporary Problems in Mathematical Physics also organised in Cotonou from October 31st to November 5th, 1999, and October 28th to November 2nd, 2001, respectively, we are now confident that these scientific events have launched a long and promising scientific tradition in Western Africa, called to take place on this regular basis every second year in the Republic of Benin. Indeed, these COPROMAPH conferences, as they are now known, are organised under the auspices of the International Chair in Mathematical Physics and Applications located in Cotonou, within the University of Abomey-Calavi, Republic of Benin. The Proceedings of each of the COPROMAPH editions are available as successive volumes in a series published by World Scientific Publishing, Singapore.

Furthermore, for the last two days of the actual COPROMAPH3 Workshop, a special session was also organised in parallel dedicated to physics, water resources and the environment: The West African Monsoon Multidisciplinary Analysis (AMMA) Project. The hope, clearly, being to foster cross-fertilisation of mathematical techniques and physics problems arising within each of the two scientific communities sharing the same conference facilities for a few days.

Scientific meetings such as the COPROMAPH Workshops, and hopefully further such satellite scientific gatherings, provide a unique opportunity for mathematical and theoretical physicists of the African continent to meet and initiate stimulating collaborations both within Africa as well as with scientists from other parts of the world also attending these events. In particular, it is hoped that the greatest benefits will go to the younger generations of African scientists, whose responsability it is to build the basis for a scientific and technological tradition and expertise in Africa extending far beyond the new century into the young millenium, capable of addressing with the appropriate and state-of-the-art scientific tools and methods the challenges specific to the African environment.

Over 113 participants from Africa, Europe and North America attended this Third Workshop, with over 32 other scientists attending the satellite AMMA meeting. COPROMAPH3 presentations included two series of in-

vited plenary lectures that lasted throughout the Workshop every morning, as well as shorter research communications organised in three parallel sessions every day, according to the following general themes.

. Theoretical Methods of Modern Classical and Quantum Physics
. Coherent states, Wavelets and Geometric Methods in Theoretical Physics
. Functional Analysis, Special Functions and Orthogonal Polynomials

A very significant fraction of these contributions is collected in this Proceedings volume, following a strict refereeing process through which not all the submitted manuscripts could be accepted for publication, which includes some of the AMMA manuscripts.

The Third International Workshop on Contemporary Problems in Mathematical Physics was made possible through the generous financial support in different forms of many Institutions. The organisers wish to express their most special thanks to the Government of the Republic of Benin through its Ministry for Higher Education and Scientific Research, the University of Abomey-Calavi and its Vice-Chancellor, and all the other Sponsors mentioned in the official opening and closing Addresses reproduced in the next pages, as well as in the list provided hereafter.

Beyond the contributions of the participants, the efforts of many people, too numerous to be all named explicitly here, helped shape this Third Workshop and the satellite special AMMA session into the successful meetings they turned out to be once again, and yet even more so. That they may all find here the expression of our gratitude, the fruits of their hard and dedicated work becoming each time more plain for all to witness with each new COPROMAPH edition. It is especially gratifying to see an always growing number of the younger African scientists presenting their own contributions of great quality.

Let us all meet again, together with new collaborators, at the Fourth International Workshop on Contemporary Problems in Mathematical Physics, COPROMAPH4, sometime early November 2005.

Jan Govaerts
M. Norbert Hounkonnou
Alfred Z. Msezane

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Opening Address by
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· Members of the International Institutions,
· Members of the Minister's Cabinet,
· Vice-Chancellor of the University of Abomey-Calavi,
· Director General of the
Centre Béninois de la Recherche Scientifique et Technique,
· Members of the ICMPA Executive Secretariat,
· Members of the ICMPA Scientific Council,
· Dean of the Faculty of Sciences and Technology,
· Director of the Institute of Mathematics and Physical Sciences,
· Deans and Directors of the
Faculties, Schools and Institutes of the University of Abomey-Calavi,
· Members of the local organizing committee,
· Professors and Researchers,
· Honorable Guests,

The present conference, the Third International Workshop on Contemporary Problems in Mathematical Physics (COPROMAPH3) honours our country, the Republic of Benin, in all respects.

Indeed, the Government of Benin shares with the scientists the conviction that development is a requirement for the evolution of the whole of humanity and that it can only be founded on the acquirement of the most advanced sciences. This is the reason why, from very early on, we very favorably welcomed the idea of organizing these International Workshops on Contemporary Problems in Mathematical Physics (COPROMAPH). It is in this context that our country has had the distinguished honour to host its two previous editions, COPROMAPH1 and COPROMAPH2.

At the COPROMAPH1 Conference, it had been accepted that the International Workshop on Contemporary Problems in Mathematical Physics will take place every two years in the Republic of Benin. It is a responsability that, thanks to the dynamism of the local organizing committee members, the Executive Secretariat of the International Chair in Mathematical Physics and Applications has met with remarkable ability. Indeed,

COPROMAPH1 took place from October 31st to November 5th, 1999, and COPROMAPH2 from October 28th to November 2nd, 2001, in Cotonou. Today again, precisely at the same period, we are attending, with pride, the COPROMAPH3 Workshop. The regularity of this conference is confirmed and henceforth scientists, at the national, regional and international levels, should refer to this instituted tradition and adapt their activities consequently. The Government of Benin greets this level of organization by the ICMPA Executive Secretariat and this determination to raise our country to the rank of nations of science. In this objective, the scientific community can rely on the solid commitment of my Ministry to do everything possible to help your Institution maintain this course.

Dear Researchers,

The evocation of Mathematical Physics as the main theme opens up a field of hope to the generations of students and young researchers of our Universities. Mathematical Physics is an important instrument of development. Indeed, the abstraction specific to mathematical physics formulae does not prevent this science from being the pedestal of technologies and therefore the basis of progress. Obstructing the way to the development of Mathematical Physics means closing the door of the future to oneself. The Beninese Government thanks you for your commitment to contribute to the development of this science in Africa and assure it a place of choice, in this third millennium, among the most advanced continents in the fields of basic sciences.

This is the place to thank the eminent scientists coming from North America, Europe and Africa to assess the Contemporary Problems in Mathematical Physics, and to define new research directions.

Finally, it is with great pleasure that we note that, in spite of the smallness of the means put at the disposal of the ICMPA, it has organized ever since its creation, only two years ago, important activities for the scientific renown of our country. We can mention: the organization of scientific retreats for young researchers, the management of a UNESCO project, the opening of Ph.D. and Master's degree courses, to only cite the most important activities. The passion and the determination with which these activities are led incite us to say that the Beninese Government was right to rely, at the beginning, on the international scientific community that created the ICMPA. We only regret one thing: it is that the reduced means did not allow the University, the ministerial and governmental authorities to

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do better at present for the ICMPA. Nonetheless, we take here the solemn engagement to take and pursue actions in order to provide this young scientific Institution with the necessary means. In return, we would like to exhort the Executive Secretariat to tirelessly continue its action to make the ICMPA and consequently Benin a scientific pole of reference in Africa and in the world.

Ladies, Gentlemen,

To conclude, we would like to wish that, during your stay, you should also have the pleasure to discover the diversity and cultural wealth of our country. In sum, welcome onto the African soil of Benin.

It is with these words that we declare open on this Monday, November 3rd, 2003, the Third International Workshop on Contemporary Problems in Mathematical Physics.

Thank you.

Mr. Didier HOUEHA
Director of the Minister's Cabinet
Speaking on behalf of Minister Professor Kèmoko Osséni BAGNAN

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Opening Address by
The Vice-Chancellor of the University of Abomey-Calavi

· Minister for Higher Education and Scientific Research,
· Deans and Directors of the
Academic Institutions of the University of Abomey-Calavi,
· President of the ICMPA,
· Members of the ICMPA Executive Secretariat,
· Members of the ICMPA Scientific Council,
· Members of the local and international organizing committees,
· Professors and Researchers,
· Honorable Guests,

The University of Abomey-Calavi is happy to perpetuate the tradition of the International Workshops on Contemporary Problems in Mathematical Physics, known under the acronym of COPROMAPH, in effectively organizing COPROMAPH3, two years after the second Workshop of the series.

The positive answer that you, prominent researchers and internationally renowned Professors, have given to the call of the ICMPA is more than an encouragement to the development of high-level research in our African universities. With good reason, we are proud of it.

Indeed, as it appears from the themes of the communications which will be submitted to this Workshop, Mathematical Physics feeds, with the necessary vigor, a larger spectrum of disciplines of Mathematics and Theoretical Physics. The creation within African Universities of Postgraduate programs in Mathematical Physics and the regular meeting, on due date, of the COPROMAPH Workshops to reinforce postgraduate studies, establish a definite commitment towards the development of scientific research on the continent.

Ladies and Gentlemen,
Honorable Guests,

You easily understand the immensity of our joy at the University of Abomey-Calavi to welcome today, at this third edition of the COPROMAPH Workshops series, eminent specialists of Mathematical Physics coming from various scientific Institutions of North America, Europe, Africa and Asia.

The postgraduate students and the young researchers of our Universities and research centers, have a large interest in experiencing these moments of scientific exchange with the famous researchers the COPROMAPH Workshops give them the opportunity to meet. They draw from it new ideas susceptible to favorably contribute to their training and their own research work. Their supervisors find there a privileged framework to come to terms with themselves and to discuss their most recent research results.

One of the remarkable innovations of this edition is the coupling of your traditional Workshop with a parallel session on Physics for the Environment. Such an initiative is beneficial and makes the ICMPA an Institution ready to bring its contribution to the resolution of the actual problems of sustainable development. We exhort you to pursue in this direction.

We would like to take this opportunity to greet the dynamism of the ICMPA Executive Secretariat, the architect of this edition. Even during only the first months after its creation, the activities of this Institution were so intense in our country and gave such a renown to our University that I must recognize that my predecessors were right to support it. This is the reason why I make before you the firm commitment to follow their steps, in pursuing the constant support of our University to the ICMPA in its ambitions for a wide scientific renaissance of our Universities.

The University of Abomey-Calavi would like to express its acknowledgments to the Institutions for having willingly allowed their researchers to take part in this Workshop. It is the place to publicly thank all the sponsors which contributed in the organization of COPROMAPH3.

Mr. Minister for Higher Education and Scientific Research, we are aware that, without your support, meetings such as this one, have no chance of success. Once again, the University of Abomey-Calavi thanks you.

It is with these words that, on behalf of the entire academic community of Benin, I welcome our guests and wish full success to your work.

I thank you.

Professor Salifou ALIDOU
Vice-Chancellor of the University of Abomey-Calavi

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Opening Address by the ICMPA President

· Representative of His Excellency,
the Minister for Higher Education and Scientific Research,
· Vice-Chancellor of the University of Abomey-Calavi,
· Deputy Vice-Chancellor of the University of Abomey-Calavi,
· Members of the Cabinet of the
Vice-Chancellor of the University of Abomey-Calavi,
· Director General of the
Centre Béninois de la Recherche Scientifique et Technique,
· Director of the Institut de Mathématiques et de Sciences Physiques,
· Deans and Directors of
Faculties, Schools and Institutes of the University of Abomey-Calavi,
· Members of the organizing committee,
· Dear Professors and Researchers,
· Honorable Guests,

I would like, first, to welcome all our famous guests coming from Africa, North America, Asia and Europe. The third edition of the International Workshop on Contemporary Problems in Mathematical Physics (COPROMAPH3) officially opens today under the auspices of the International Chair in Mathematical Physics and Applications (ICMPA), born at the second COPROMAPH edition. The general assembly of this large scientific gathering is ICMPA's supreme body. I must therefore briefly give an account of the activities accomplished over the past two years.

Honorable Guests,
Dear Colleagues,
Dear Participants,

We remember that, in his closing address at COPROMAPH2, the Minister for Higher Education and Scientific Research had made the solemn commitment that the Beninese Government would bring its support to the newborn Chair. To be honest, I must tell you that this promise has been kept in spite of the inherent difficulties in such enterprises. Thus, the ICMPA has been provided with a head office by the Beninese Government. We are now tackling the problems of its equipment. Moreover, a personnel composed of an administrative secretary, a word processing operator and a chief of protocol, has been put at our disposal. Let us also mention that

three Departmental Orders institutionalizing, respectively, the creation, the organization and the functioning of the Chair, and the nominations of the Executive Secretariat and the Scientific Committee members have been promulgated.

On behalf of the Chair and its Executive Secretariat, I would like to take this opportunity to present my sincere acknowledgments to Mr. Minister for Higher Education and Scientific Research, to all his Cabinet, and to the Academic Authorities of the University of Abomey-Calavi, for their constant solicitude and for having kept their word. However, I would like to point out that, unfortunately, the ICMPA has not been provided with a budget for the years 2002 and 2003. I would like to hope nevertheless that the Minister and his entire team, conscious of the stakes, will not spare their support as they did in the past and will take all possible steps so that the ICMPA has a budget to the level of its ambitions.

Let us now come, in broad terms, to the activities organized by the ICMPA.

1. A scientific retreat is held every year in the first two weeks of August. It is a one week school centered onto a very specific scientific topic. During that period, lectures are delivered by some specialists of the considered field. Researchers are invited to attend these lectures for their training. This year, the retreat was organized around the topic "Operator Theory in Hilbert Spaces".
2. The Laboratoire de Modélisation en Hydrologie of the Chair is currently carrying out a UNESCO project on the "Applications of Remote Sensing to the Integrated Management of Water Resources and Ecosystems in Africa". The launching workshop of this project took place in October 2002. In August 2003, we welcomed an assessment mission from UNESCO. This activity allowed us to establish links between the Chair and some Institutions that are now fully-fledged partners. It is therefore most naturally that a parallel session on Physics for the environment, taking place on November 6^{th} and 7^{th}, 2003, is associated to the present COPROMAPH edition.
3. The ICMPA is actively preparing the opening of specific training courses, in accordance with current international standards, to reach the goals of its objectives. The leaflet on these courses is available and may be found on the web site of the Chair (`http://www.cipma.net`).

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Honorable Guests,
Ladies and Gentlemen,

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3. Coopération Inter-universitaire Institutionnelle au Développement (CUD-CIUF) along with the belgian French speaking universities;
4. The Abdus Salam International Center for Theoretical Physics, Trieste, Italy;
5. The Center for Theoretical Studies of Physical Systems, Clark Atlanta University, Atlanta, Georgia, USA;
6. The Catholic University of Louvain, Louvain-la-Neuve, Belgium;
7. The University of Abomey-Calavi;
8. ATC Beko;
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19. Gevoise (Groupe d'Etude Geste et Voix);
20. Hôtel du Port, Republic of Benin;
21. Hôtel Croix du Sud, Republic of Benin;
22. Sun Beach Hotel, Republic of Benin;
23. La Riviera.

I would like to take this opportunity to all address them my cordial acknowledgments.

Dear Colleagues,

On your behalf, I would like to especially express the gratitude of the ICMPA to Professor Jan Govaerts of the Catholic University of Louvain (Louvain-la-Neuve, Belgium) and Professor Alfred Msezane of Clark At-

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lanta University (Atlanta, USA) for their constant support and the gigantic and ungrateful work of coordination and edition that precedes each publication of the COPROMAPH Proceedings. The effort is immense, inestimable and sometimes depressing when the requested style formats for the finalization of the submitted contributions are not followed, even by ourselves. The sole moral comfort, as you will admit, remains that the volumes are very nice. In advance, I already thank the editors for what they will not fail to do for the next Proceedings volume that will be produced following the present Workshop.

Ladies and Gentlemen,

As has become usual, this COPROMAPH Workshop will include:

1. plenary sessions during which 55 minutes invited talks will be delivered, and,
2. 20 minutes short communications divided into three parallel working groups, namely:
   - theoretical methods of modern quantum physics;
   - coherent states, wavelets and the geometric methods in theoretical physics;
   - functional analysis, special functions and orthogonal polynomials.

Over 200 researchers were foreseen to attend COPROMAPH3. The means available did not allow us to welcome all of them. It is a record number compared to the previous two editions. The local organizing committee, which I have the honour to coordinate, will do its utmost best to make your stay with us as pleasant as possible for all of you. We apologize for the imperfections that may occur because COPROMAPH is above all a human enterprise.

Thank you.

Professor Mahouton Norbert HOUNKONNOU
President of the ICMPA
Chairman of the COPROMAPH3 Executive Secretariat

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Opening Address by The President of the ICMPA at The Opening Ceremony of The COPROMAPH3/AMMA Parallel Session

First of all, I would like to say, welcome onto the hospitable soil of Benin to all our prominent guests from Africa and Europe.

The organization, on due date, since 1999, of the International Workshop on Contemporary Problems in Mathematical Physics (COPROMAPH) has solidly established this reality.

The third edition of this large scientific gathering that COPROMAPH has become, has a particular character in that it integrates within itself the organization of a Colloquium on "The West African Monsoon Multidisciplinary Analysis" (AMMA) (Physics, Water Resources and the Environment).

The launching of a UNESCO project on the "Applications of the Remote Sensing to the Integrated Management of Water Resources and Ecosystems in Africa" by the Laboratoire de Modélisation en Hydrologie of the International Chair in Mathematical Physics and Applications (ICMPA) establishes the scientific collaboration between researchers, experts on environmental problems, that you are, and Mathematical Physics researchers of the ICMPA.

Congratulations to all those who have strived for such a result. I encourage them to pursue this beautiful endeavour since it involves natural scientific relationships (physics, water resources, the environment and mathematical physics). Allow me to express the wish that in the future the AMMA Symposium will no longer be a parallel session of the classic COPROMAPH Workshop but rather be organized into in a session entirely integrated within COPROMAPH and running over the entire duration of the Workshop. The diversity and importance of the many communications programmed for these two days bears witness to this necessity.

Moreover, I would like to congratulate each of you for having brilliantly been selected by the international organizing Committee to take part in this Symposium. It is important to emphasize this merit, given the selection criteria that prevailed.

I wish full success to your work.

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It is with these words, and in my capacity as holder of the International Chair in Mathematical Physics and Applications, that I have the pleasure to proceed to the opening of your Symposium, on this Thursday, November 6^{th}, 2003.

Thank you.

Professor Mahouton Norbert HOUNKONNOU
President of the ICMPA

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Closing Address by the ICMPA President

· Cabinet Director of
the Minister for Higher Education and Scientific Research,
· Members of the Ministerial Cabinet,
· Vice-Chancellor of the University of Abomey-Calavi,
· Members of the UAC Vice-Chancellor's Cabinet,
· Members of the ICMPA Executive Secretariat,
· Members of the Local Organizing Committee,
· Eminent Professors and Researchers,
· Honorable guests,

In a moment, we shall be closing COPROMAPH3 and its special Symposium on environmental problems, after seven days of intense and fruitful work. Communications followed one another every 20 minutes. It was necessary to be concise and precise to present the essential of one's work. The invited talks were enriching, delivered with pedagogy and rigour, so that lectures rooms were always packed. Allow me, on your behalf, to address our recognition to all these famous invited lecturers and more especially to our two colleagues, Professors Gerard Goldin of Rutgers University (USA) and Jan Govaerts of the Catholic University of Louvain (Louvain-la-Neuve, Belgium), who presented exceptionally brilliant and exhaustive lectures.

In the Working Groups, one could notice the same zeal. One can therefore strongly assert that in November 2003, the international scientific community present in Cotonou lived a week of unrelenting scientific activity, packed with exchanges of knowledge and the opening-up of new research avenues.

Honorable Guests, Dear Participants,
Ladies and Gentlemen,

The ICMPA has just completed with success the organization of its main activity thanks to the support of all. I thank all those who brought their contributions to this vivid success.

I mostly have in mind here our generous sponsors, namely:

1. The Government of the Republic of Benin;
2. Université Paris Sud XI, France;
3. Coopération Inter-universitaire Institutionnelle au Développement (CUD-CIUF) along with belgian French speaking Universities;
4. The Abdus Salam International Center for Theoretical Physics, Trieste, Italy;

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5. The Center for Theoretical Studies of Physical Systems, Clark Atlanta University, Atlanta, Georgia, USA;
6. The Catholic University of Louvain, Louvain-la-Neuve, Belgium;
7. The University of Abomey-Calavi;
8. ATC Beko;
9. Société des Ciments du Bénin;
10. Société Etudes et Réalisations d'Ouvrages Hydrauliques, EROH;
11. Association Internationale de Physique Mathématique;
12. La Télévision Nationale du Bénin;
13. Institut de Recherche pour le Développement;
14. Faculté des Sciences et Techniques de l'Université d'Abomey-Calavi;
15. Institut de Mathématiques et de Sciences Physiques;
16. Ambassade de France au Cameroun;
17. Centre Béninois de la Recherche Scientifique et Technique;
18. Hôtel du Port, Republic of Benin;
19. Port Autonome de Cotonou, Republic of Benin;
20. Sun Beach Hotel, Republic of Benin;
21. Hôtel Croix du Sud, Republic of Benin;
22. La Riviera.

I would also like to mention some Universities that have been willing to help us and contribute by buying travel tickets for our invited lecturers:

1. Concordia University of Montréal, Canada;
2. Université Paris 6, France;
3. Université de Rouen, France;
4. Bialystok University, Poland;
5. The State University of Byelorussia, Byelorussia;
6. Institut de Mathématiques de l'Académie des Sciences, Czech Republic;
7. Université de Perpignan, France;
8. Rutgers University, USA;
9. Clark Atlanta University, USA.

Finally, we address our gratitude to the Institut de Recherche pour le Développement (IRD), our sponsor for the special Symposium AMMA/COPROMAPH3.

Ladies and Gentlemen,

The different promises of the representative of the Minister for Higher Education and Scientific Research and the Vice-Chancellor of the University

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of Abomey-Calavi for a solid support of the ICMPA are welcome and we can reassure you, Dear Colleagues, that we will not spare any effort to help these authorities in the fulfillment of these promises by preserving the memory of the facts. The success of the present scientific events foretell of a beautiful future for the scientific reputation of the ICMPA, our Universities and the research Institutions of the continent.

To conclude, Ladies and Gentlemen, allow me to make a veiled reference to the local organizing committee, the main architect of these events. I would like you to especially applaud and thank:

1. Koudoukpo Paul, Head of Cabinet;
2. Djessou Jean, administrative secretary;
3. Allagnon Gisèle, word processing secretary;
4. Soglohoun Gérard, chief of protocol;
5. Olory Bienvenu;
6. Aguessi Mesmin, *a.k.a.*, AGMES Photo, our COPROMAPH3 special reporter and his entire team;
7. Yéhouénou Bertin;
8. Kossouho Felix, our untiring Mr. Welcome, always on his way between travel agencies, the CIPMA and the airport, even at meal hours;
8. Sodoga Komi, COPROMAPH3 special secretary and,
9. our two brave ladies Gouba Laure and Tafoti Uguette who we have deprived of much sleep at night to reach this level of organization. We do not forget all the other discrete actors remaining in the shadows who contributed to the success of COPROMAPH3, notably our journalist friends of the written and audiovisual media.

Honorable Guests, Ladies and Gentlemen, the tradition of the COPROMAPH Workshops must continue for the sake of all the benefit that our researchers and scientists actually derive from them. Which is the reason why, while wishing you a safe return, I say, see you again at COPROMAPH4 which will take place from Saturday, October 29th to Friday, November 4th, 2005.
Thank you.

Professor Mahouton Norbert HOUNKONNOU
President of the ICMPA
COPROMAPH3 Executive Director

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Closing Address by
The Vice-Chancellor of the University of Abomey-Calavi

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· Minister for Higher Education and Scientific Research,
· Deans and Directors of the
Academic Institutions of the University of Abomey-Calavi,
· President of the ICMPA,
· Members of the ICMPA,
· Members of the Scientific Council,
· Members of the local and international organizing committees,
· Professors and Researchers,
· Honorable Guests,

Just as you think about rejoining your Institutions of origin and your families, at the end of one week of exchanges, I am delighted, on behalf of the entire academic community of Benin, to thank you once again for having accepted to contribute to the Third International Workshop on Contemporary Problems in Mathematical Physics. The service thus rendered to Africa and the International Scientific Community is invaluable and it is justified to believe in the positive impact that, as a whole, your exchanges will have had on the future of Scientific Research in all our Institutions. I take for proof of this conviction the high quality of your communications covering a great deal of Mathematical Physics. I am convinced that the young researchers have derived the largest benefit from all these contributions.

The organization on the African continent of workshops of such a high level as is that of the present event, is so rare an occasion that the University of Abomey-Calavi is happy to contribute to its realization.

On behalf of the entire academic family, I thank the Minister for Higher Education and Scientific Research for the support of his department in the preparations and the actual running of the Workshop.

I congratulate the promoters for their courage and their enthusiasm in the realization of this international meeting. I reserve a special award to the Executive Secretariat of the ICMPA, which dedicated so many days and will dedicate still more to finalize the work of this important Conference. In the efforts that this Institution develops, it can rely on the support of the University of Abomey-Calavi. This entire endeavour is to the honour

of our country and the whole African continent. Hence, all together with you, let us summon up our courage and take up this challenge.

It is with these words that I wish each and everyone of you an excellent journey back, hoping that you carry with you the best of memories of Benin.

Thank you.

Professor Salifou ALIDOU
Vice-Chancellor of the University of Abomey-Calavi

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Closing Address by
The Representative of His Excellency,
the Minister for Higher Education and Scientific Research

· Vice-Chancellor of the University of Abomey-Calavi,
· Academic Authorities of the University of Abomey-Calavi,
· President of the ICMPA,
· Members of the Executive Secretariat of the ICMPA and
the Local Organizing Committee of COPROMAPH3,
· Dear Researchers and Professors,
· Honorable guests,

On behalf of the Minister for Higher Education and Scientific Research, and at the end of the COPROMAPH3 Workshop, I would like to present my congratulations and my acknowledgments to all the participants for the quality of the work done in view of the results that have reached us. It is beyond doubt that COPROMAPH3 has by far and large achieved its objectives. This is the place to especially congratulate the International Chair in Mathematical Physics and Applications (ICMPA), and through it, its Executive Secretariat and the organizing Committee for their impressive work, in spite of the scarce means put at their disposal.

On behalf of the Minister, I make the commitment that in the future the ICMPA will enjoy a remarkable attention from the Government and the Ministry for Higher Education and Scientific Research. The COPROMAPH Workshop of November 2005 will undoubtedly be an indicator of the solicitude and the asserted determination of the authorities of our country.

To the address of all the participants, I ask them to forget the hiccups of the organization, because no human work is perfect. I dare believe that the touristic visits allowed you to discover some of the cultural and artistic realities of Benin.

Wishing you a safe return in your respective countries and to your families, I declare closed the Third International Workshop on Contemporary Problems in Mathematical Physics (COPROMAPH3).

Thank you.

Mr. Didier HOUEHA
Director of the Minister's Cabinet
Speaking on behalf of Minister Professor Kèmoko Osséni BAGNAN